CLAIMS

1. A bonding method of bonding a first object to be bonded and a second object to be bonded by a pressurizing operation, the bonding method comprising

a first step of causing a first holding member and a second holding member to respectively hold the first object to be bonded and the second object to be bonded in such a manner that a bonding surface of the first object to be bonded and a holding surface of the second object to be bonded face to each other,

a second step of treating the bonding surface of the first object to be bonded and the holding surface of the second object to be bonded with a treatment liquid under a condition wherein the first object to be bonded and the second object to be bonded are held by the first holding member and the second holding member, and

a third step of pressurizing the first object to be bonded and the second object to be bonded toward each other by the first holding member and the second holding member in order to bond both the bonding surfaces close to each other.

2. A bonding method according to claim 1, wherein

the first step includes a step of detecting an image of the bonding surface of the first object to be bonded and an image of the bonding surface of the second object to be bonded under the condition wherein the first object to be bonded and the second object to be bonded are held by the first holding member and the second holding member, and of positioning the first object to be bonded and the second object to be bonded based on both the images.

3. A bonding method according to claim 1 or 2, wherein

the second step includes a step of forming a treatment space for containing the first object to be bonded and the second object to be bonded, and of introducing the treatment liquid into the treatment space.

4. A bonding method according to any of claims 1 to 3, wherein

the second step includes

a step of removing oxide films on both the bonding surfaces by a medicament, and

a step of cleaning both the bonding surfaces by a cleaning liquid.

5. A bonding method according to any of claims 1 to 4, wherein

the third step includes a heating step of heating the first holding member and the second holding member in order to promote bonding between both the bonding surfaces.

6. A bonding method according to claim 5, wherein

the heating step includes

a step of heating the first holding member and the second holding member at a first temperature just after both the bonding surfaces are brought in close contact with each other, and

a step of heating the first holding member and the second holding member at a second temperature higher than the first temperature.

7. A bonding method according to any of claims 1 to 6, wherein

a wiring structure is formed and exposed on each of the bonding surfaces, and

both the wiring structures are brought in close contact with each other when both the bonding surfaces are brought in close contact with each other.

8. A bonding method according to claim 7, wherein

the wiring structure is made of Cu.

9. A bonding method according to claim 7 or 8, wherein each of the bonding surfaces is, at least partly, made of Cu.

10. A bonding method according to any of claims 1 to 9, wherein

the first object to be bonded is any of a semiconductor wafer, an interposer, a semiconductor tip, a package and a printed wiring board, and

the second object to be bonded is any of a semiconductor wafer, an interposer, a semiconductor tip, a package and a printed wiring board.

11. A bonding apparatus comprising,

a first holding member and a second holding member that respectively hold a first object to be bonded and a second object to be bonded in such a manner that a bonding surface of the first object to be bonded and a holding surface of the second object to be bonded face to each other,

a pressurizing mechanism that conducts a pressurizing operation of both the bonding surfaces toward each other by bringing the first holding member and the second holding member closer to each other,

a treatment chamber that forms a treatment space for containing the first object to be bonded and the second object to be bonded respectively held by the first holding member and the second holding member,

a treatment-liquid supplying mechanism that supplies a treatment liquid into the treatment chamber, and

a treatment-liquid discharging mechanism that discharges the treatment liquid from the treatment chamber.

12. A bonding apparatus according to claim 11, further comprising

a positioning mechanism that conducts a relative positioning operation of the first object to be bonded and the second object to be bonded respectively held by the first holding member and the

second holding member.

13. A bonding apparatus according to claim 11 or 12, further comprising

a first head member that supports the first holding member, and

a second head member that supports the second holding member,

wherein

the treatment chamber includes:

a first chamber wall supported by the first head member and arranged so as to surround the first holding member,

a second chamber wall supported by the second holding member and arranged so as to surround the second object to be bonded held by the second holding member,

a first sealing member that seals a connection part between the first chamber wall and the second chamber wall, and

a second sealing member that seals a gap between the first holding member and the first chamber wall.

14. A bonding apparatus according to any of claims 11 to 13, wherein

the treatment-liquid supplying mechanism and the treatment-liquid discharging mechanism cooperate to sequentially conduct an operation of removing oxide films on both the bonding surfaces by supplying a medicament as a treatment liquid, and an operation of cleaning both the bonding surfaces by supplying a cleaning liquid as a treatment liquid.

15. A bonding apparatus according to any of claims 11 to 14, wherein

the first head member is further provided with

a first heating mechanism arranged capably of abutting with a back side of the first holding member, the first heating

mechanism heating the first object to be bonded held by the first holding member, and

a first heater-driving mechanism that conducts an abutting operation and a separating operation of the first heating mechanism to the back side of the first holding member, and

the second head member is further provided with

a second heating mechanism arranged capably of abutting with a back side of the second holding member, the second heating mechanism heating the second object to be bonded held by the second holding member, and

a second heater-driving mechanism that conducts an abutting operation and a separating operation of the second heating mechanism to the back side of the second holding member.

16. A bonding apparatus according to any of claims 11 to 15, wherein

the first heating mechanism is capable of abutting with the first holding member and heating the first holding member under a condition wherein the first heating mechanism has been heated at a predetermined first temperature in advance, and then capable of heating the first holding member at a second temperature higher than the first temperature, and

the second heating mechanism is capable of abutting with the second holding member and heating the second holding member under a condition wherein the second heating mechanism has been heated at a predetermined first temperature in advance, and then capable of heating the second holding member at a second temperature higher than the first temperature.

17. A bonding apparatus according to any of claims 11 to 16, wherein

the first holding member is provided with a absorbing-and-holding member that absorbs and holds the first object to be bonded in a removable manner, and

the second holding member is provided with a absorbing-and-holding member that absorbs and holds the second

object to be bonded in a removable manner.

18. A bonding apparatus according to any of claims 11 to 17, wherein

the positioning mechanism includes a first camera that takes an image of the second object to be bonded held by the second holding member and a second camera that takes an image of the first object to be bonded held by the first holding member, and is adapted to align both the bonding surfaces by relatively moving the first head member and the second head member in accordance with positional recognition based on both the images.